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A Review on Detection and Rectification of Distorted Fingerprints

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Abstract—false non-match occurs because of Elastic distortion of fingerprints. Elastic distortion is produced because of the inherent flexibility of fingertips. This problem affects all fingerprint recognition applications. In negative recognition applications like watch list and deduplication applications. In some application, users make out purposely distort their fingerprints to hide their identification. This paper presents Fingerprint Matching Approach based on SVM (Support Vector Machine) Classifier and this paper also conduct a study on fingerprint distortion and to develop an algorithm for the detection of fingerprint distortion from a single image captured using traditional fingerprint sensing technology. A SVM classifier is used to perform the classification task. to solve the related problems, different database of various distorted reference fingerprints and corresponding distortion fields is first built in the offline stage and then in the online stage. The nearest neighbor of the input fingerprint is observed in the database and the corresponding distortion operation is used to resolve the input fingerprint into a normal fingerprint.

Keywords-Internet Elastic Distortion, SVM classifier, ridge orientation map and period map.

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I INTRODUCTION

Main SVM classifier is used to classify whether the input fingerprint is distorted or not. Instead of having automatic fingerprint recognition techniques have rapidly advanced in the last forty years, still there exists several research problem such as low quality fingerprints are difficult for recognizing. A number of factors are responsible for the degradation of fingerprint image quality, such as small finger area, cuts and abrasions, wet and dry finger, dirt on the finger and skin distortion. Fingerprint matcher matches the accuracy of the images is very sensitive to image quality which is observed in the FVC2006, and the matching accuracy differs among various datasets as due to difference in image quality by using the same algorithm. The consequence of low quality fingerprints depends on which type of the fingerprint recognition system used. There are two types of systems used for the fingerprint recognition systems are negative and positive recognition system. In the positive recognition system means at the real accessibility control techniques, the person is cooperative and wants to be identified [1]. Low quality will lead to false reject in in a positive recognition system of legitimate users and inconvenience occurs. In a negative recognition system, like identifying persons in watch lists and detecting various names who are enrolled multiple times, supposed criminals is to be uncooperative and cannot be identified. Hence it is very important to detect low quality fingerprints for negative fingerprint recognition systems so that malicious users can not compromise the fingerprint systems [2]. Mostly used fingerprint quality control software is the well-known NIST(National institute of standards and technology) fingerprint image quality software (NFIQ), however, a very important quality factor which is skin distortion, is not considered in NFIQ[2]. In a negative fingerprint recognition system, security level is as weak as the weakest point. Thus for all the purposes it is necessary to improve distorted fingerprint detection systems to fill the hole of fingerprint quality.

II FINGERPRINT MATCHING APPROACH BASED ON SVM CLASSIFIER

A. Proposed Approach

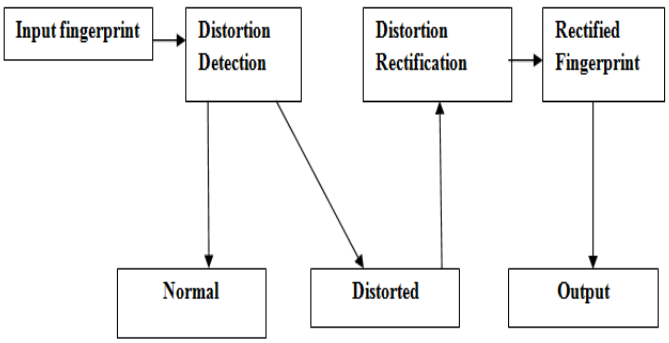

Figure 1. Flow diagram of the proposed distortion detection and rectification system.

1) Distortion Detection

Distortion detection is considered as a two class classification problem [4]. We have used documented form ridge orientation map and with period map for the purpose that

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feature vector, and that is additional classified through the SVM classifier[5].

2) Reference Fingerprint

We kept a distorted fingerprint database known as Tsinghua distorted fingerprint database in order to recognize statistics of realist fingerprint distortion. For the data collection, A FTIR (Fourier Transform Infrared Spectrophotometry) fingerprint scanner, audio tape capture functionality was used. Each user is asked to put a finger on the scanner in a normal way. Suppose a lock stock and 320 videos were obtained from 185 disparate fingers. Each finger produces 1to10 videos and each video is having only one out of ten various distortion types. In the register, the first frame is the balanced fingerprint, and the last frame is consisting of largest distortion. The length of each video is about 10 seconds and in each video only the normal fingerprint and the distorted fingerprint are used for testing. It is important to note that all fingerprints is having a resolution of 500 ppi. Between training and testing data there are no common fingerprints. We use number of fingerprints as reference fingerprints which is consisting of logical fingerprints from FVC2002 DB1_A, pairs of normal and distorted fingerprints from the training set of Tsinghua DF database. Core points can be correctly detected of the fingerprints by a Poincare index based algorithm. Fingerprints whose upper core points are not at the proper time detected in that case we add the center point.

3) Feature Vector Extraction

By sampling registered orientation manual and also continuance map, a feature vector is extracted. The entire fingerprint is covered by the grid of period map and the top part of the fingerprint is covered by the sampling grid of orientation map. This occurs because the orientation maps below finger center are very different within normal fingerprints. so they are not important features for differentiation improper fingerprints from normal fingerprints.

4) Performance of Distortion Detection

In this, we consider the eventual distortion detection algorithm. Then, we calculate the proposed untruth rectification algorithm by performing related experiments on the databases. We notice that distortion detection is a two-class detailed list problem. In this Distorted fingerprints are considered as positive samples and healthy fingerprints are considered as negative samples. a true confident occurs only when If a mistaken fingerprint is divided as a clear enjoy. If a wise fingerprint is divided into a positive sample, a false positive occurs. The set of Tsinghua DF database consists of pairs of distorted and balanced fingerprints. FVC2004 DB1 contains 791 levelheaded fingerprints and 89 untrue fingerprints, which are found by visually examining the images. Although practically fingerprints boot be accurately divided, where there are several false negatives and false positives. False negatives are only for the distortion. we found that this is not a problematic problem for fingerprint matchers can match some distorted fingerprints. the proposed rectification algorithm rectifies this challenging fingerprint, the matching can be further improved[3].

5) Distorted fingerprint Rectification.

Rectifying distorted fingerprints is the final purpose for improving related performance. The distorted fingerprint can be generated by using a strange distortion field to the normal fingerprint. In case if we can compute the distortion field in the offered distorted fingerprint, we can effortlessly correct it into the normal fingerprint by using the inverse of distortion field estimation. And hence we have to use a regression problem, which is rather challenging because of excessive dimensionality with the distortion field [2].

III DISTORTED FINGERPRINT MATCHING PERFORMANCE IMPROVEMENT BY ESTIMATION OF ORIENTATION MAP AND PERIOD MAP

Figure 2. The right one is consisting of severe distortion as illustrated by the triangles. The match score is computed by a known commercial fingerprint matcher, VeriFinger, is 0 between these two images. According to the known NIST fingerprint image quality (NFIQ) assessment algorithm, the quality level of both images is 1, at the highest level.

A. Proposed Approach

Our approach is able to detect the distortion which is based on a single fingerprint image. An important benefit of the proposed technique is that it can be easily incorporated into automatic fingerprint recognition systems, as it does not need to design new fingerprint sensors. It can detect distorted fingerprints in databases and it does not require any type of change of fingerprint matchers.

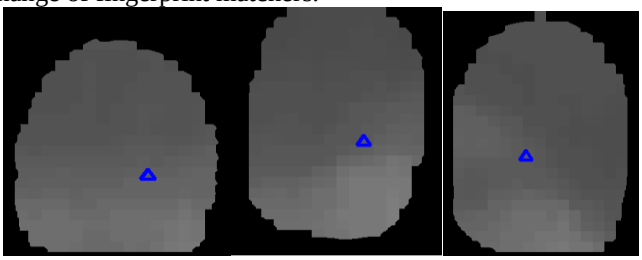

Figure 3. Ridge period images of three normal fingerprints

1) Ridged Period

The ridges in a normal fingerprint are constantly spaced which is the common assumption. On the basic of the assumption, the standard deviation of ridge period in the image of the whole fingerprint can be used to differentiate distorted fingerprints from normal fingerprints. However, after examining many fingerprints, it is concluded that there is not uniform nature in the ridge period in normal fingerprints. As can be observed from the three normal fingerprints ridge period images, ridge period below the delta is generally larger than that other region. Here it is needed to detect the delta point by using Verifinger and draw a horizontal separating line passing through it.in this the region which is above the

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separating line, only used to compute delta. In the whole image delta is better in the cropped fingerprint. If the deltapoint is not detected separate line is drawn passing through the middle point. In absence of point, the separating line is set.

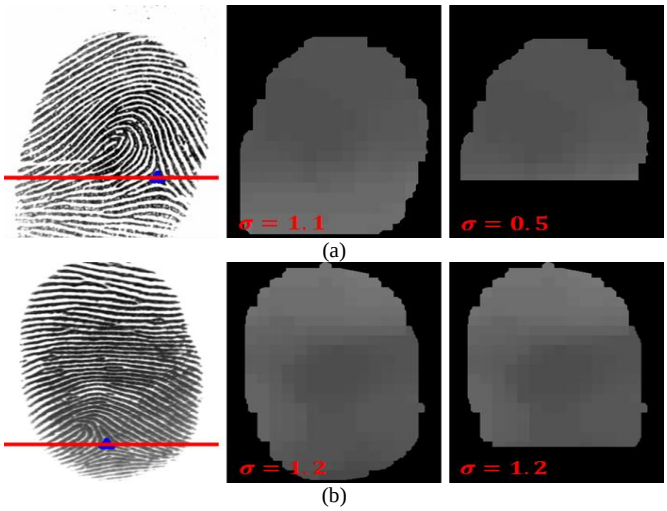


Figure 4. (a) Normal fingerprint (b) Distorted fingerprint

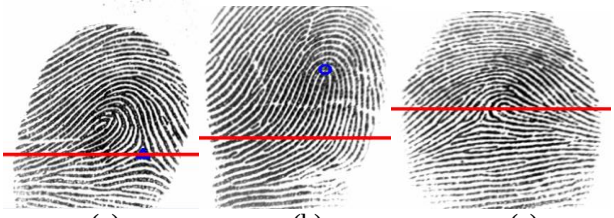


Figure 5. (a) delta is detected; (b) delta is missing but the core is detected; and (c) no singular points are detected.

2) Ridge Orientation

A fingerprint is classified into three regions: top region, middle region, and bottom region. in the middle region, Singular points always appears. Fingerprint pattern such as arch, loop, whorl division is based on the orientation field which is in the middle region; this region is also called as the pattern area in the literature. The origin field in the top region and bottom region of finger is similar for various fingerprints as we can observe from the ridge orientation fields. In absence of core points, the part which is above the vertical center of the finger can be said as the top region. Ridges present in the top region of a balanced fingerprint are concave in shape.

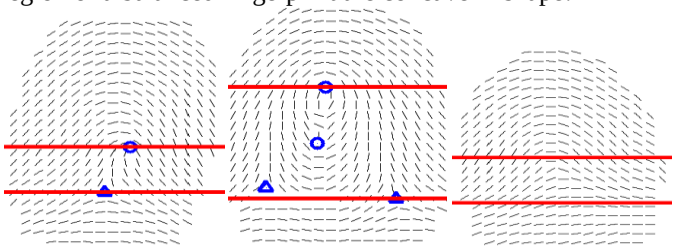
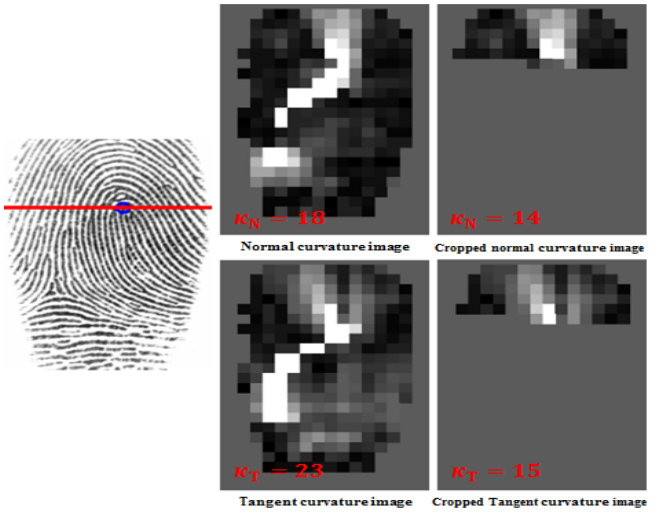


Figure 6. Orientation field of three patterns



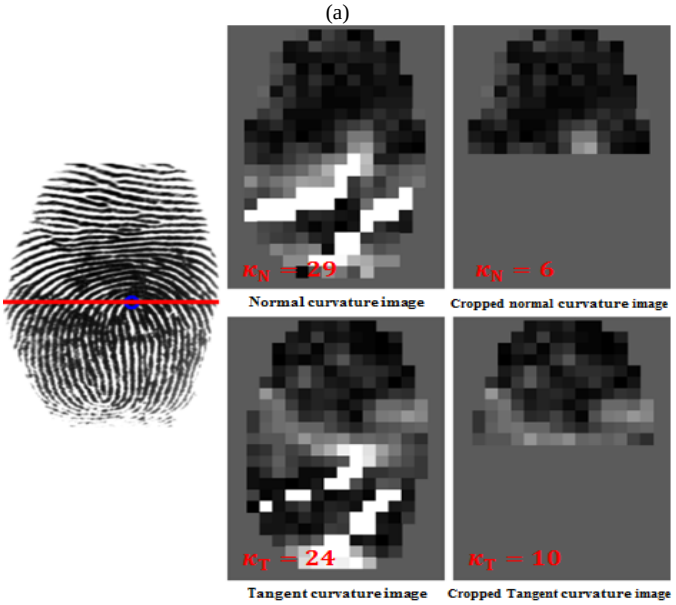


Figure 7. (a) Normal fingerprint (b) Distorted fingerprint

We observed that in number of distorted fingerprints, ridges in the top region are having a smaller curvature. We can compute the normal curvature image and the tangent curvature image of a particular fingerprint. This means K_N and K_T of the curvature images are used as the features.

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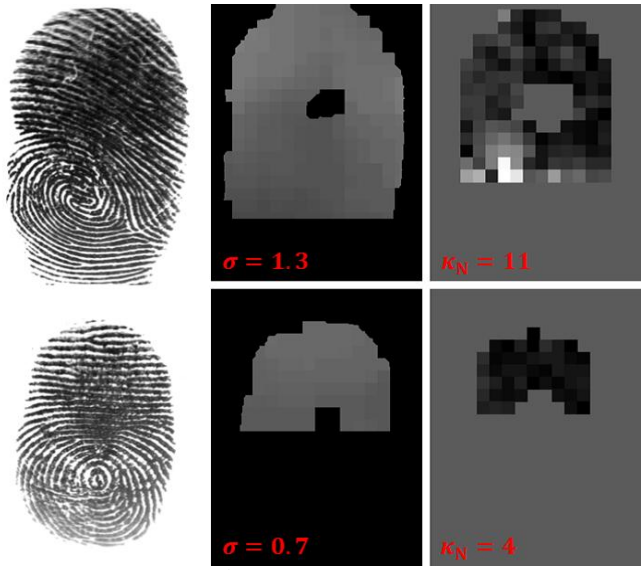

Figure 8.The top distortedfingerprint cannot be detected based only on the curvature image, while thebottom distorted fingerprint cannot be detected based only on the periodimage.

3) Fusion

Here the discriminating power of each of the three features is limited,so use the weighted sum rule for the fusion of the three features into a distortion degree.

$$d = w_1\sigma' + w_2(1 - \kappa'_{\mathrm{N}}) + w_3(1 - \kappa'_{\mathrm{T}}),$$

From equation

Following are the normalized features in the range[0,1]

$$\kappa'_{\mathrm{N}}\ \sigma'\ \kappa'_{\mathrm{T}}$$

With using the min-max normalization and the weights are empirically set as 0.2, 0.5, and 0.3. Simple fusion rule choses as it does not require a large number of samples for the purpose of training. Two examples are given to show the advantage of the fusion.

III CONCLUSION

Rates of False non-match about fingerprint matchers are very high in case of seriously improper fingerprints. This creates a security hole in fingerprint recognition systems and may be utilized by criminals. So to avoid such things, it is necessary to develop high secured a fingerprint distortion detection and rectification algorithms to fill the hole. This paper presented proper fingerprint detection and rectification techniques using SVM classifier and an algorithm for the detection of fingerprint distortion from a single image. SVM classifier is applied to predict the input fingerprint as improper or normal. This paper also proposed a novel approach based on analyzing ridge period and orientation information for the detection of the distorted fingerprints. Such algorithm is able to detect distortion from a single Image, obtained with using traditional fingerprint sensing techniques. This paper also describes the fusion of proposed distortion estimation algorithm with the NFIQ algorithm, so the ability of predicting fingerprint quality is improved.

REFERENCES

[1] Ms. Dhaka Renuka B, Prof. Jondhale S. D “RESEARCH IN IDENTIFICATION AND RECTIFICATION OF DISTORTED FINGERPRINTS”.

[2] Xuanbin Si. JianjiangFeng,Jie Zhou“ Detecting Fingerprint Distortion from a single Image”.I

[3] AvinashKonduriN.Uma Rani, K. Jaya Shree “PURIFICATION DETECTION AND RECTUS DISTORTED FINGERPRINTON” International Journal of modern Trends in Engineering and Research.

[4] Mary Kanakam,C.AnnaPalagan “DISTORTED FINGERPRINT MATCHING PERFORMANCE IMPROVEMENT BY ESTIMATION OF ORIENT ATION MAP AND PERIOD MAP”. .international Journal of Advanced Research in Management, Architecture, Technology andEngineering (IJARMATE) Vol. 2, special issue 6, March 2016.

[5] K. Amulya, V. Priyanka, Ch. Sudheer Kumar “Flawless Fingerprint Matching Approach based on SVM Classifier”.International journal for research in applied science and Engineering Technology(IJRASET).